

IN THE SPECIFICATION:

Insert the heading beginning at page 1, line 4 as follows:

BACKGROUND OF THE INVENTION

Heading beginning at page 1, line 5 has been amended as follows:

1. TECHNICAL FIELD OF THE INVENTION

Paragraph beginning at page 1, line 6 has been amended as follows:

The present invention relates to a liquid crystal display panel ~~constituting the essential~~
~~forming a part of a liquid crystal display device, and more particularly, to a liquid crystal display~~
panel suited for displaying patterns (characters, mark graphics, and so forth) in the shape as
required in cloudy white or black, or in the form of a colored pattern against a transparent
background.

Heading beginning at page 1, line 13 has been amended as follows:

BACKGROUND TECHNOLOGY 2. DESCRIPTION OF THE RELATED ART

Paragraph beginning at page 2, line 3 has been amended as follows:

Accordingly, through a combination of a polarizing film disposed on both sides of the
liquid crystal cell or by the ~~agency of the~~ use of the liquid crystal cell itself, parts of the liquid
crystal layer where a voltage is applied come to differ from parts of the liquid crystal layer where

no voltage is applied, in terms of transmission / absorption or scattering of light, or hue of light, thereby enabling a variety of displays to be effected.

Paragraph beginning at page 2, line 18 has been amended as follows:

For this reason, in the case of a liquid crystal display panel using, for example, twisted nematic (TN) liquid crystal in a liquid crystal layer, it has been possible to effect consistent display across the entire area of a display region in a condition wherein no voltage is applied to the liquid crystal layer, but impossible to do so in a condition wherein a voltage is applied thereto because the voltage ~~can not~~ cannot be applied to regions of the gaps where no electrode has been installed.

Paragraph beginning at page 2, line 25 has been amended as follows:

Further, in the case of a liquid crystal display panel for selectively displaying isolated patterns against a background in consistent display, there is a need of forming wiring electrodes for use in applying a voltage to electrodes constituting respective isolated pattern display portions, in such a way as to cross electrodes in a background region while providing a gap between the electrodes and the wiring electrodes. As with the case of the signal electrodes and the opposite electrodes, the wiring electrodes are formed of a transparent and electrically conductive film, such as an indium tin oxide (ITO) film.

Paragraph beginning at page 3, line 8 has been amended as follows:

However, if, for effecting display at any of the pattern display portions, a voltage is intended to be applied to a signal electrode and an opposite electrode for the relevant pattern display portion, this will cause a problem that, ~~[[since]]~~ because the voltage is applied via a wiring electrode connected to the signal electrode, the voltage will be applied to a portion of the liquid crystal layer between the wiring electrode and the opposite electrode as well, so that a region of the wiring electrode as well as the relevant pattern display portion is turned into a display state.

Paragraph beginning at page 3, line 16 has been amended as follows:

Accordingly, the wiring electrodes are rendered very thin in width so as to be inconspicuous, ~~however~~. However, if the same are rendered too thin, this will increase electric electrical resistance, causing a problem of poor responsivity in display.

Paragraph beginning at page 3, 20 has been amended as follows:

Also, in the case of a liquid crystal display panel for use in a finder viewfinder of a camera, and the like, it is important from the viewpoint of enhanced visibility from a viewer to have evenness in an even display across the entire area of a display region, and to have a transmittance as high as possible, except for necessary patterns such as a target pattern for auto focus, and the like.

Paragraph beginning at page 4, line 14 has been amended as follows:

However, when no voltage is applied to electrodes at the display portions, no voltage is applied to wiring electrodes connected thereto either, and consequently, no voltage is applied to a portion of the liquid crystal layer interposed between the wiring electrodes and the opposite electrodes, so that the portion of ~~[[the]]~~ that liquid crystal layer ~~[[are]]~~ is not turned into a transparent state. Consequently, it follows that the entire region of the liquid crystal layer, other than the regions of the necessary display portions, ~~can not~~ cannot be rendered transparent.

Paragraph beginning at page 4, line 22 has been amended as follows:

The present invention has been developed to solve such problems as described in the foregoing, and it is therefore an object of the invention to provide a liquid crystal display panel capable of displaying isolated patterns against a transparent background, wherein a consistently transparent state can be attained with ease across the entire area of a display region, other than regions of necessary pattern display portions, in a condition where a voltage is applied to a liquid crystal layer in a background region.

Heading beginning at page 5, line 4 has been amended as follows:

DISCLOSURE SUMMARY OF THE INVENTION

Paragraph beginning at page 5, line 5 has been amended as follows:

To attain the object as described above, a liquid crystal display panel according to the present invention is comprised as follows.

Paragraph beginning at page 5, line 7 has been amended as follows:

A first substrate with signal electrodes formed on a face thereof is bonded to a second substrate with an opposite electrode formed on a face thereof at a given spacing provided by a peripheral sealing section interposed therebetween on the periphery of a display region such that the signal electrodes are opposed ~~[[to]]~~ the opposite electrode, and a liquid crystal layer is installed ~~in-between~~ in between the spacing.

Paragraph beginning at page 5, line 13 has been amended as follows:

The signal electrodes ~~comprise~~ include a peripheral electrode formed substantially across the entire area of the display region, pattern electrodes formed in isolation within the peripheral electrode, and wiring electrodes formed across the peripheral electrode with a gap provided between the same and the peripheral electrode for selectively applying a voltage to the respective pattern electrodes.

Paragraph beginning at page 6, line 7 has been amended as follows:

According to the present invention, the wiring sealing sections formed of the transparent sealing material, instead of the liquid crystal layer, are installed between the wiring electrodes and the opposite electrode, and optical properties of the wiring sealing sections are rendered equal to those of the liquid crystal layer where a voltage has been applied, whereby a transmittance of the portions of the liquid crystal layer in a condition where the voltage has been

applied becomes substantially equal to that of the wiring sealing sections, so that quasi-consistent display can be attained across the entire area of the display region.

Paragraph beginning at page 6, line 16 has been amended as follows:

In the case of using a scattering type liquid crystal layer composed of mixed liquid crystal comprised of liquid crystal and transparent solids as the liquid crystal layer, with a scattering type liquid crystal layer to which a transparent state occurs by applying a voltage thereto, by installing the wiring sealing sections which are transparent in gaps between the wiring electrodes and the peripheral electrode as well, a substantially uniform transmittance can be obtained with ease over the entire area of the display region ~~due to~~ as a result of a transparent state of the liquid crystal layer and transparency of the wiring sealing sections, in a condition where a voltage is applied to the liquid crystal layer. Further, by installing a sealing section formed of the same transparent sealing material as a transparent sealing material for the wiring sealing sections in gaps between the respective pattern electrodes and the peripheral electrode as well, a more uniform transmittance can be obtained over the entire area of the display region.

Paragraph beginning at page 7, line 23 has been amended as follows:

Further, for the peripheral sealing section, a sealing material having high reliability is adopted in order to protect the liquid crystal layer from the application environment of the liquid crystal display panel; ~~however.~~ However, for the wiring sealing sections for which transparency is particularly important, a material lower in hardness and softer (more elastic) than a material

used for the peripheral sealing section, such as a resin not prone to accumulation of stress, is preferably used so as to reduce stress on the liquid crystal layer as much as possible against changes in temperature of the liquid crystal display panel.

Paragraph beginning at page 8, line 20 has been amended as follows:

It is possible to employ the pattern electrodes of the signal electrode as target display portions for auto focus, in the shape of a target pattern which are installed in the ~~finder~~ viewfinder of a camera.

Paragraph beginning at page 9, line 14 has been amended as follows:

With the liquid crystal display panel provided with the light source as described above, ~~[[since]]~~ because a transparent state occurs ~~[[to]]~~ over the entire area of the display region by applying a voltage to the target electrodes and the peripheral electrode, outgoing light from the light source travels in a straight line through the liquid crystal layer, and is not sent out in a direction along which it is transmitted through the first substrate or the second substrate. By selectively stopping voltage application to the target electrodes, the light from the light source can be sent out in a direction along which it is transmitted through the first substrate or the second substrate due to the scattering property of the part of the liquid crystal layer.

Paragraph beginning at page 9, line 24 has been amended as follows:

Hereupon, for example, as seen by the viewer from the external side of the second

substrate, the light from the light source comes out only from a display portion corresponding to the target electrode to which no voltage is applied, but does not come out from a background region surrounding the display portion, and consequently, this is quite effective owing to resulting from no deterioration of visibility in the case of the viewer seeing given information on the first substrate side of the liquid crystal display panel through the background region while the target pattern is displayed by the target electrode.

Paragraph beginning at page 10, line 7 has been amended as follows:

The light source is preferably disposed at the location opposite to the shorter side of the wiring sealing sections, suited for emitting light from outside of the peripheral sealing section. By causing the light emitted by the light source to fall on the liquid crystal layer from the peripheral part of the liquid crystal display panel, it is possible to obtain a contrast ratio between the background region displayed by the agency of the peripheral electrode, and the target display portions displayed by the agency of the target electrodes, ~~however~~. However, there is a risk of reflection occurring at the boundary between the liquid crystal layer and the wiring sealing sections due to a slight difference in refractive index between the liquid crystal or the organic polymers, in the liquid crystal layer, and the wiring sealing sections with the result that a portion of the light emitted by the light source can be seen through the wiring sealing sections. For this reason, the light source is preferably disposed at the location as described above in order to obtain evenness in display of the background region.

Paragraph beginning at page 11, line 25 has been amended as follows:

Further, by coloring the adiabatic sealant, it is also possible to prevent the light emitted from the light source from being reflected from the periphery of the liquid crystal display panel. In particular, it is preferable to color the adiabatic sealant so as to render the same to double as a light absorption layer capable of absorbing light in color of the emitted light of the light source. Further, the adiabatic sealant may be colored ~~[[in]]~~ black, thereby absorbing light at all wavelengths in the visible range.

Paragraph beginning at page 13, line 15 has been amended as follows:

~~BEST MODE FOR CARRYING OUT THE INVENTION~~ DETAILED DESCRIPTION OF
THE PREFERRED EMBODIMENTS

Paragraph beginning at page 14, line 18 has been amended as follows:

Figs. 4 to 6 are views showing more clearly the constitution of the first substrate, the sealing sections, and the second substrate, respectively, as shown in Fig. 1, respectively.

Paragraph beginning at page 14, line 21 has been amended as follows:

The first substrate is a transparent glass substrate, and as shown in Fig. 4, on a face (in the figure, the top face) thereof, there are provided the peripheral electrode 11 formed substantially over the entire area of the display region, three portions of the target electrodes 5a, 5b, 5c formed in isolation within the peripheral electrode 11 in the shape of a target pattern for auto focus, and

the wiring electrodes 8a, 8b, 8c respectively connected to the target electrodes 5a, 5b, 5c, all of which serve together as the signal electrodes 20 made up of an indium tin oxide (ITO) film which is a transparent and electrically conductive film.

Paragraph beginning at page 15, line 4 has been amended as follows:

On the surface of the first substrate, and in the vicinity of the edge along one of the sides thereof, three connecting electrodes 12, 13, 14 for the target electrodes, respectively, and a connecting electrode 15 for the peripheral electrode, are installed in line. Furthermore, a connecting electrode 24 for the opposite electrode formed on the second substrate is installed on the first substrate as well. All these connecting electrodes are formed of the same ITO film as the ITO film used for the signal electrodes 20.

Paragraph beginning at page 15, line 17 has been amended as follows:

As shown in Figs. 2 and 3, gaps G1, G2 are provided between the peripheral electrode 11 and the respective target electrodes 5a, 5b, 5c, and between the peripheral electrode 11 and the respective wiring electrodes 8a, 8b, 8c, respectively. The gaps are preferably rendered smaller in width because of inconspicuousness; ~~however,~~ However, a width of 10 micrometers (mm) or more is required to ensure sufficient insulation, and the width in the order of 20 mm is preferable. A width of the wiring electrodes 8a, 8b, 8c is preferably rendered to be in a range of 10 to 20 mm as well so as to prevent electric resistance thereof from becoming too large even if the thickness thereof is thin.

Paragraph beginning at page 16, line 1 has been amended as follows:

The second substrate 2, which ~~[[are]]~~ is opposed to the first substrate 1 with the spacing in a range of 7 to 10 micrometers (mm) provided therebetween is a transparent glass substrate as well, and as shown in Fig. 6, on a face (in the figure, the underside face) thereof, the opposite electrode 21 made up of an ITO film is formed over the entire area of the display region. A wiring electrode 23 is formed for the opposite electrode as well.

Paragraph beginning at page 16, line 26 has been amended as follows:

The present invention ~~is characterized by~~ has sealing sections. As with the case of a conventional liquid crystal display panel, the peripheral sealing section 3 as described above has the functions of hermetically sealing the liquid crystal layer 18, bonding the first substrate 1 with the second substrate 2 while keeping the given spacing therebetween, and protecting the liquid crystal layer 18 from an ambient environment.

Paragraph beginning at page 17, line 6 has been amended as follows:

With the liquid crystal display panel according to the present invention, however, wiring sealing sections 6a, 6b, 6c formed of a transparent sealing material are provided between the respective wiring electrodes 8a, 8b, 8c installed for applying a predetermined voltage to the respective target electrodes 5a, 5b, 5c, and the opposite electrode 21, and also in gaps between both sides of the respective wiring electrodes 8a, 8b, 8c, and the peripheral electrode 11, such that the liquid crystal layer 18 is not interposed in those regions.

Paragraph beginning at page 17, line 14 has been amended as follows:

With the first embodiment of the present invention, the wiring sealing sections 6a, 6b, 6c are formed of the same sealing material as a sealing material for the peripheral sealing section 3 in such a way as to be continuous with each other as shown Fig. 5.

Paragraph beginning at page 19, line 2 has been amended as follows:

Then, in order to prevent the liquid crystal display panel from undergoing a rapid change in temperature ~~due to~~ resulting from a change in circumstances, a gap between the panel holding frame 31 and the panel fixture frame 38 is filled up with an adiabatic sealant 39 made of silicone resin. Additionally, by use of the ~~agency of~~ the adiabatic sealant 39, the panel holding frame 31 is fixedly attached to the panel fixture frame 38.

Paragraph beginning at page 19, line 8 has been amended as follows:

Upon irradiation of the liquid crystal layer 18 with light rays at a wavelength shorter than 380 nanometers (nm), the liquid crystal layer 18 becomes increasingly yellowish in color, thereby deteriorating ~~[[a]]~~ the degree of scattering. For this reason, on the external face of the first substrate 1 as well as the second substrate 2, an ultraviolet cutoff film 41 is installed for preventing degradation of the liquid crystal layer 18 due to irradiation with light rays (ultraviolet rays) at a wavelength shorter than 380 nanometers (nm).

Paragraph beginning at page 20, line 8 has been amended as follows:

With the liquid crystal display panel according to this embodiment, regions where the respective target electrodes 5a, 5b, 5c, and the peripheral electrode 11 composing the signal electrodes, are opposed to the opposite electrode 21 constitute display pixels, and by applying a voltage between the respective target electrodes 5a, 5b, 5c and the peripheral electrode 11 on one side, and the opposite electrode 21 on the other side, via the FPC 36, the liquid crystal layer 18, which is in a scattering state when no voltage is applied thereto, can be turned into a transparent state.

Paragraph beginning at page 20, line 21 has been amended as follows:

[[[Since]]] Because the gaps around the respective target electrodes 5a, 5b, 5c are not provided with a transparent sealing material, and the liquid crystal layer 18 with no voltage applied thereto is in a scattering state, outlines of the respective target electrodes are dimly visible, however, such a state is all the more desirable in the case of application as a finder viewfinder module of a camera because this will allow a viewer to recognize the location of a target pattern beforehand.

Paragraph beginning at page 23, line 4 has been amended as follows:

As indicated by a chain line 64 in Fig. 12, in regions of the liquid crystal layer 18 where the defects 45, 46 have occurred, a transmittance does not go up to a sufficiently high level in spite of an increase in applied voltage, and consequently, a transparent state ~~can not~~ cannot occur thereto.

Paragraph beginning at page 24, line 11 has been amended as follows:

A constitution of a liquid crystal display panel according to a modification example 1, in other respects, is the same as that for the liquid crystal display panel according to the first embodiment, and therefore, a description thereof is omitted. In Fig. 10, parts corresponding to those in Figs. 1 to 9 are denoted by like reference numerals for convenience in description.

Paragraph beginning at page 24, line 17 has been amended as follows:

With the constitution as described above, in case that rapid cooling of the liquid crystal display panel occurs due to a drop in temperature of an ambient environment, a defect 45 occurs to a liquid crystal layer 18 in the vicinity of the inner edge of the peripheral sealing section 3 due to resulting from thermal conduction and thermal contraction thereof, however, since the respective wiring sealing sections 6a, 6b, 6c are formed in the pattern of an island away from the peripheral sealing section 3, the thermal conduction is blocked, and thermal contraction reacts to the periphery of the respective wiring sealing sections 6a, 6b, 6c, thus hardly causing defects to occur to the periphery thereof.

Paragraph beginning at page 25, line 11 has been amended as follows:

[[With]] In this example, a peripheral sealing section 3 is formed of a sealing material different from that for wiring sealing sections 6a, 6b, 6c. That is, the wiring sealing sections 6a, 6b, 6c are formed of a sealing material lower in hardness, and softer (greater in elastic coefficient) than that for the peripheral sealing section 3.

Paragraph beginning at page 25, line 23 has been amended as follows:

The liquid crystal display panel according to the second embodiment is also a case wherein the present invention is applied to a liquid crystal display module used for a finder viewfinder of a camera, and is characterized in ~~[[that]]~~ which the liquid crystal display panel is provided with a light source causing light to fall on a liquid crystal layer from a side face of the liquid crystal display panel.

Paragraph beginning at page 28, line 5 has been amended as follows:

As with the case of the first embodiment, for the liquid crystal layer 18, use is made of a scattering type liquid crystal layer composed of liquid crystal and transparent solids obtained by converting organic monomers mixed in the liquid crystal into organic polymers through ultraviolet irradiation. ~~[[Since]]~~ Because such a liquid crystal layer as described has no orientation when no voltage is applied thereto, the same exhibits scattering properties as slight and numerous reflections are repeated between the liquid crystal and the organic polymers.

When a voltage is applied, orientation of the liquid crystal layer is enhanced, and further, difference in refractive index between the liquid crystal and the organic polymers is almost eliminated, so that scattering of light does not occur, and a transparent state occurs to the liquid crystal layer.

Paragraph beginning at page 28, line 24 has been amended as follows:

As shown in Fig. 14, incident light rays L3 from the subject of a photograph positioned on the underside (the lens side) of the first substrate 1 and falling on regions of the liquid crystal layer where a voltage is applied, are recognized as bright since the liquid crystal layer 18 is in a transparent state. However, when no voltage is applied to the target electrode 5b, a portion of the liquid crystal layer 18b corresponding thereto is in a scattering state, and is visually recognized as dark by a viewer because incident light rays from the subject of the photograph and falling thereon, if any, are hardly barely transmitted therethrough.

Paragraph beginning at page 30, line 23 has been amended as follows:

In Fig. 14, incoming light rays L1 are shown as light components directly entering the liquid crystal layer 18. Scattered light rays L2 show light components outgoing from the light source 27 and falling on a scattering part 18b (a portion corresponding to the target electrode 5b to which no voltage is applied) of the liquid crystal layer 18, then outgoing again to the side of a viewer after undergoing scattering. ~~[[Since]]~~ Because the incoming light rays L1 undergo only slight scattering at the transparent part of the liquid crystal layer 18, the same hardly ~~[[outgo]]~~ exit to the side of the viewer. However, ~~[[since]]~~ because light components falling on the scattering part 18b of the liquid crystal layer 18 undergo scattering, and ~~[[outgo]]~~ exit to the side of the viewer, the target pattern can be seen in a bright state even in the case where it is dark on the side of the subject of the photograph.

Paragraph beginning at page 30, line 19 has been amended as follows:

By installing the peripheral electrode 11 on the periphery of the respective target electrodes 5a, 5b, 5c, and by causing a transparent state to occur to a substantially entire area of the display region, the entire region of the liquid crystal layer 18 can be illuminated. Accordingly, even if the liquid crystal layer 18 is irradiated with the outgoing light of the light source 27 emitted from the transverse direction of the liquid crystal layer 18 in the case that the peripheral electrode 11 is not installed and the liquid crystal layer 18 is in a scattering state, the outgoing light is subjected to attenuation due to resulting from scattering thereof in the liquid crystal layer 18, thereby causing non-uniformity in illumination to occur in the display region.

Paragraph beginning at page 32, line 18 has been amended as follows:

A modification example wherein the liquid crystal display panel according to the second embodiment of the present invention is partially modified is described hereinafter with reference to Fig. 15. Fig. 15 is a sectional view of the modification example similar to Fig. 14.

Paragraph beginning at page 34, line 2 has been amended as follows:

By rendering the width W1 of the wiring electrodes 8a, 8b, 8c and the width of the gap G2 on both sides thereof 10 μ m or less, respectively, and by rendering the target routing width W2 or the width of the wiring sealing sections 6a, 6b, 6c 30 μ m or less, visibility as seen by a viewer can be sufficiently lowered. By rendering the target routing width W2 or the width of the wiring sealing sections 6 μ m or less, visibility can be further lowered, ~~however,~~ However, taking into consideration alignment of the wiring sealing sections with regions where the respective

targets are routed, or an increase in electric resistance within the respective wiring electrodes, and incidence of wiring breakage, the width in a range of 6 to 30 μm is preferable.

Paragraph beginning at page 34, line 12 has been amended as follows:

Further, with the liquid crystal display panel shown in Fig. 15, the ultraviolet cutoff film 41 is installed on the surface of the first substrate 1 as well as the second substrate 2, on a side thereof opposite from the liquid crystal layer 18, for preventing irradiation of the liquid crystal layer 18 with ultraviolet rays. For ordinary application, the liquid crystal display panel without the ultraviolet cutoff film 41 presents no problem in respect of reliability. However, in the case where light from the subject of a photograph emitting ultraviolet rays arrives at the liquid crystal display panel for a long duration, the ultraviolet cutoff film 41 serves useful functions. In addition, an anti-reflection coating (not shown) is installed on top of the ultraviolet cutoff film 41. With the anti-reflection coating installed, it becomes possible to prevent occurrence of shadows, and so forth, caused by reflected light from the liquid crystal display panel being reflected off other components.

Paragraph beginning at page 35, line 25 has been amended as follows:

By installing an anti-reflection film on the surface of at least either one of the first substrate 1 and the second substrate 2 of the liquid crystal display panel, it is possible to prevent multiple reflection reflections from occurring between the liquid crystal display panel and a component installed on the top side and the underside thereof, respectively. The anti-reflection

film may be in the form of a film, and by use thereof combined with the ultraviolet cutoff film 41, it is possible to prevent coloring of the liquid crystal layer due to ultraviolet irradiation, or degradation in transmittance dependency on applied voltage.

Paragraph beginning at page 36, line 8 has been amended as follows:

As described hereinbefore, the embodiments of the present invention as applied to a liquid crystal display module installed in a finder of a camera are described, however, the scope of the invention is not limited thereto, and the invention is applicable to a liquid crystal display panel in various usage. In such cases, a display pattern may be in the form of various characters, signs, graphics, and so on, and the target pattern represents merely an example.

Paragraph beginning at page 36, line 17 has been amended as follows:

Further, although description is made of an example wherein the scattering type liquid crystal layer is used as the liquid crystal layer, other kinds of liquid crystal layers may be used. For example, the present invention is applicable to a liquid crystal display panel made up of a liquid crystal layer using twisted nematic liquid crystal or supertwisted nematic liquid crystal, in combination with polarizing films. However, even in such a case, the polarizing films need to be disposed such that a transparent state occurs to the liquid crystal layer when a voltage is applied thereto. In this case, however, a scope of application is limited because a transmittance in a transparent state deteriorates.

Delete the paragraph beginning at page 37, line 1 as follows:

~~INDUSTRIAL APPLICABILITY~~

Paragraph beginning at page 37, line 2 has been amended as follows:

As is evident from the foregoing description, according to the present invention, with a liquid crystal display panel capable of displaying isolated patterns within a transparent background, in a condition wherein a voltage is applied to a background region of a liquid crystal layer, the entire area of a display region, other than a necessary pattern display, can be turned into a consistent transparent state.